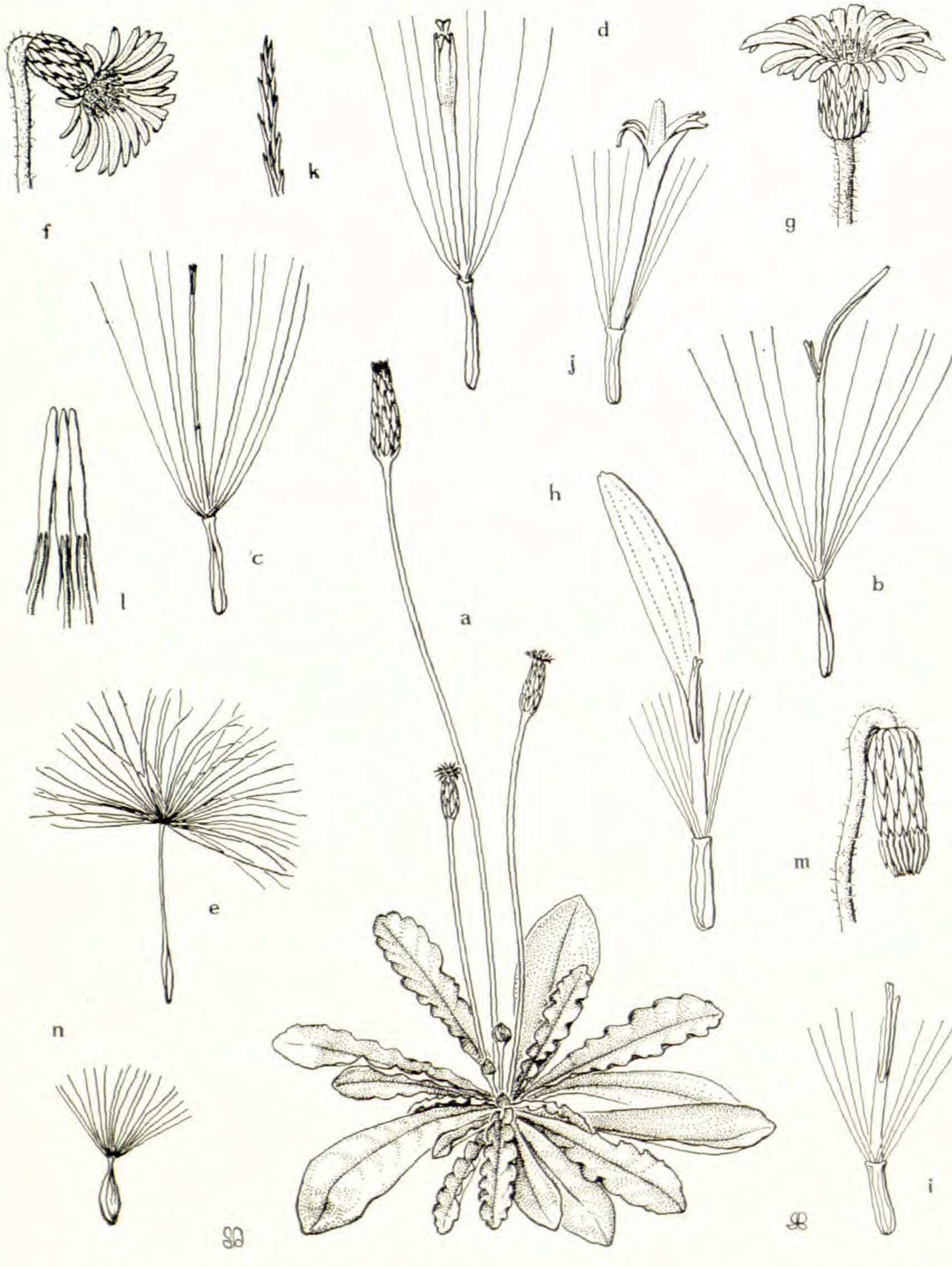

FIG. 1. **Chaptalia.** a–e, *C. dentata*: a, flowering plant, × 1/2; b, outer floret, side view, × 4; c, filiform floret of second series, × 4; d, perfect central floret, × 4; e, mature achene with pappus, × 2. f–n, *C. tomentosa*: f, flowering head on a cloudy day, × 1; g, same on a sunny day, × 1; h, outer floret, × 4; i, floret of second series, × 4 (cf. *c*); j, bilabiate central floret, × 4; k, tip of pappus bristle, × 50; l, three stamens, abaxial side, partly separated, with blunt apical appendage and "tailed" base, × 6; m, lateral view of head with developing fruit, × 1; n, mature achene with pappus, × 2. Note most pappus bristles omitted throughout with only enough included to show appropriate length and spread.

The phenomenon of trimorphic florets found in this genus is not rare in the Compositae (Uexküll-Gyllenband), but inaccurate observations on the condition in *Chaptalia* have led to misinterpretations of both the origin of the ligulate florets (see footnote 3) and the relationships of the genus.

Most workers (Cassini, Bentham & Hooker, Hoffmann, Burkart) have allied *Chaptalia* with *Gerbera* L. (Africa and southeastern Asia) and *Trichocline* Cass. (Andean with a species in Australia). All three are similar in habit, having basal rosettes, scapose flowering stems, and the same type of white tomentum. Palynologically, however, *Chaptalia* is distinct from both *Gerbera* and *Trichocline* and is similar to *Lycoseris* Cass.,[6] another genus of the Gerberinae (cf. Bentham & Hooker). Wodehouse postulated on the basis of pollen similarities a relationship between *Chaptalia* and *Lycoseris* which he supported with evidence from floral morphology, suggesting that both have outer florets without (or with reduced) inner lips and "staminate" florets with undivided styles. *Gerbera* and *Trichocline*, he maintained, have, in contrast, monomorphic perfect florets with bilabiate corollas. Examination of specimens, however, shows the styles of *Chaptalia* always to be bipartite, even in the functionally staminate central florets of certain species (presumably the "staminate" florets of Wodehouse), and the ray corollas of several species of *Chaptalia* are distinctly bilabiate. The floral morphology of *Gerbera*, like that of *Chaptalia*, appears to be much more variable than Wodehouse thought. Monomorphic bilabiate corollas are not a constant character throughout *Gerbera*, and eight or nine species (of 30 to 35 species) have heads with dimorphic florets. In addition, some individuals of *Chaptalia* lack one of the three floret types. In fact, when all the species of both *Chaptalia* and *Gerbera* are carefully examined, there is complete transition between the two genera. Baillon went so far as to combine them, and both Bentham and Burkart thought it necessary to state specifically that, despite the transitions, there are enough characters in combination to justify maintaining the two as distinct genera.

The occurrence of cleistogamous (always closed) as well as chasmogamous (open and radiate) heads in *Chaptalia* is of special interest, for cleistogamy is rare in the Compositae, although it has been known in one species of *Gerbera* since the time of Linnaeus. Burkart found that both kinds of heads occur in three Argentine species of *Chaptalia* (*C. exscapa* (Pers.) Baker, *C. piloselloides* (Vahl) Baker, and *C. runcinata* HBK., the last two in the same section as our *C. dentata*). In contrast to the species of *Gerbera* which produce both types of head simultaneously on the same plant, species of *Chaptalia* apparently produce only one type at a given time on an individual plant (e.g., on a cultivated plant of *C. runcinata* cleistogamous heads in May, chasmogamous ones in

[6] The pollen of both *Chaptalia* and *Lycoseris* is spherical, tricolporate, and has vestiges of spines. *Gerbera* and *Trichocline* have pollen which is slightly ellipsoidal, tricolporate, almost smooth, and which has the "remarkable character" (cf. Wodehouse) of intercolpar thickenings (i.e., between the furrows).

winter (July), and cleistogamous again the next February). Burkart interpreted this seasonal variation as an adaptation to life on the Argentine pampas.

Although Solbrig mentioned the possibility of apomixis in *Chaptalia*, various experiments suggest that this does not occur. Burkart emasculated and bagged the heads of five South American species but found no indication of seed production. On the other hand, nonemasculated, bagged heads produced abundant viable seeds, showing that autogamy is probable. That self-pollination does occur in nature is suggested both by the presence of cleistogamy and by the reports that some species have involucral bracts that curl inward and force the stigmas against the pollen-producing florets. Recent experiments with *C. dentata* have shown that the plants are self-compatible. All of the full, mature achenes from a head which was not accessible to pollinators germinated. However, about 50 per cent of the achenes never matured, indicating that self-pollination is not completely effective, but, once it has occurred, there are no self-incompatibility barriers (Vuilleumier).

Artificial crosses made by Burkart between three South American species all produced F_1 hybrids which were completely, or nearly, sterile. However, natural hybrids between two other species not investigated are found in southern Brazil and northern Argentina. Chromosome numbers have been reported only for *Chaptalia piloselloides* (a species with cleistogamy, but in Burkart's experiments not apomictic), with $2n = 49–54$, 54, 51–54, 60; *C. nutans*, $2n = 48$; and *C. integerrima* (Vell.) Burkart (= *C. integrifolia* (Cass.) Baker), $2n = 48$.

The genus has no economic importance, but *Chaptalia nutans* is apparently used by Argentine Indians for infections (the leaves being applied with a little oil) and for respiratory ailments. *Chaptalia tomentosa* has been cultivated to a limited extent (cf. Bailey, Cyclop. Am. Hort. 1: 288. 1900, and 1: 734. 1928, as well as Roy. Hort. Soc. Dict. Gard. ed. 2. 1: 450. 1956).

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A NEW SPECIES OF ARENARIA FROM THE BHUTAN HIMALAYA

N. C. MAJUMDAR AND C. R. BABU

THE NEW SPECIES described in this paper was collected from Bhutan, a small mountainous country in the Eastern Himalayas, situated between 26° 40′ and 28° 0′ N. latitude and between 88° 10′ and 91° 45′ E. longitude, and lying between Tibet and India. It is composed of lofty and rugged mountains which vary in elevation from 300 meters to 7500 meters above sea level, and are separated by deep valleys. The climate of Bhutan varies according to elevation; thus, the lower southern valleys are saturated with moisture, hot and steamy; the central valleys enjoy a temperate coolness; and the extreme northern higher region has the rigors of frost and ice.

The vegetation of Bhutan, in general, is composed of tropical, subtropical, temperate, and alpine elements. Chila, the locality from which this interesting taxon has come, is a mountainous ridge situated between 3630 meters and 4120 meters in altitude, in the central tract. It is characterized by alpine vegetation which is composed of herbaceous plants such as *Ranunculus*, *Gentiana*, *Primula*, *Potentilla*, *Gaultheria*, *Arenaria*, *Cerastium*, *Stellaria*, and *Swertia*, in addition to shrubs like *Symplocos*, *Eurya*, and *Pentapanax*.

Arenaria bhutanica Majumdar & Babu spec. nov. FIG. 1.

Pertinet ad subgenus ARENARIA, affinisque nulli speciei huius generis adhuc usque notae; valde distincta habitu annuo, floribus solitariis, caule uno, pedicellis duplici linea pilorum ornatis, sepalis subacutis quam petalis brevioribus, seminibus 3–6 in una capsula.

Herba annua, gracilis, ramosa, 5–10 cm. alta; caulis quadrangularis, prostratus et glaber infra, ascendens vel suberectus et una linea longitudinali pilorum sursum; folia sessilia, opposita quidem aequalia, ad basin connata, lineari-lanceolata, carnosiuscula, integra, margine haud incrassato, ad apicem acuta, pungentia, brunneola, glabra, utrinque punctata, punctis elevatis tubercularibus circularibus, uninervia, 5–10 × 1.5–2 mm.; flores solitarii, axillares et terminales, longe pedicellati, albi, 5–8 mm. diametro; pedicello gracili, quadrangulari, fructifero paulum recurvato, linea duplici longitudinali reflexorum pilorum ornato, 1–2.5(–3) cm. longo; bracteae foliosae, saepe minores foliis inferioribus; sepala 5, usque ad basin libera, lanceolata, subacuta, marginibus late scariosis, obscure uninervia, glabra, 3.8–4 × 0.8–1(–1.2) mm.; petala alba, breviter unguiculata, oblongo-spathulata, integra, obtuso-rotundata, sepalis longiora, 5 mm. longa; stamina 10, uniseriata, 3–3.5 mm. longa; filamenta linearia,

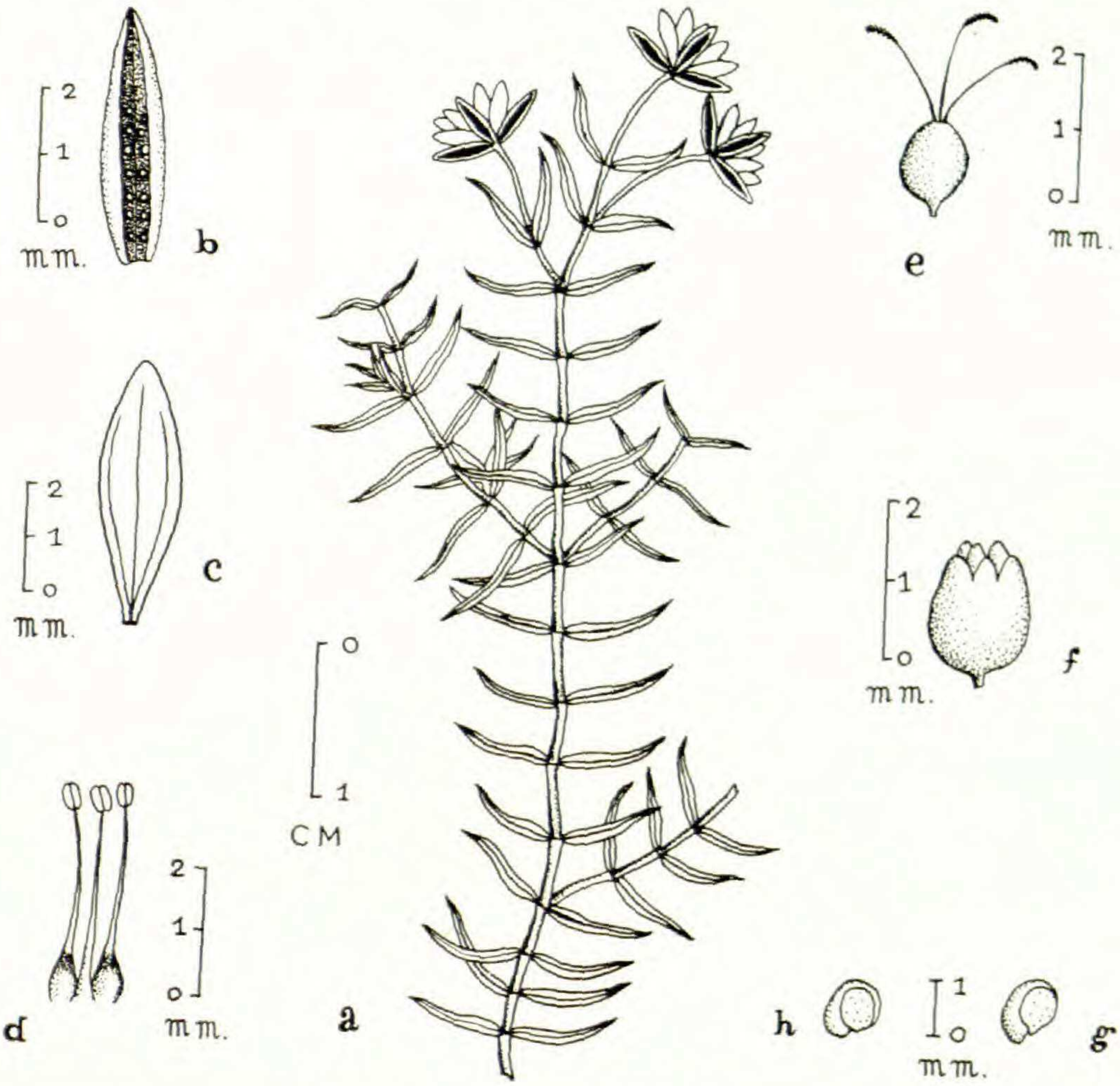

FIGURE 1. *Arenaria bhutanica*, a–h. a, habit; b, sepal; c, petal; d, stamens with and without glands at base; e, pistil; f, capsule; g and h, seeds.

ad ipsam basin connata, eorum singula alterna basi glandulifera, ovoideae brunneolae insidentia, 0.2 mm. longa; antherae minutae, ovoideae, atro-purpureae, basifixae, 0.2 mm. longae; ovarium subsessile, ovoideum, glabrum, tricarpellatum, 1.1–1.3(–1.4) mm. longum; styli terni, lineares, papillosi; capsula ovoideo-subglobosa, breviter stipitata, dehiscens ad apicem in dentes 6 obtusos, 2.8–3 mm. longos; semina (immatura) 3–6(–8), subreniformia, compressa, rubro-brunnea, levia? 0.8–1 mm. lata.

Bhutan: Chila, on way to Paro, alt. 3630–4125 m., 24 August 1963, *G. Sen Gupta 721* (holotype and isotype, CAL). Small prostrate, delicate herb with white flowers; stamens blue.

The very slender annual habit, the linear one-nerved leaves, and the obscurely nerved subacute sepals which are shorter than the petals of this remarkable species may bring it under sect. OCCIDENTALES of the subgenus ARENARIA; but apart from the fact that all the eleven species included in this section by McNeill (in Notes Roy. Bot. Gard. Edinburgh **24**: 115. 1962) are either Spanish or North African in distribution, they differ from this species in having dichasial cymose inflorescences. Among